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## THE EDGE-GROUND AXES OF SOUTH-WESTERN AUSTRALIA

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"And no one has a right to say that no water-babies exist, till they have seen no water-babies existing; which is quite a different thing, mind, from not seeing water-babies . . ."  
—Charles Kingsley. "The Water-babies."

### INTRODUCTION

The edge-ground axe, an artefact of considerable importance in Australian ethnological speculation, is commonly believed not to occur in South-Western Australia (see Davidson and McCarthy, 1957; McCarthy, 1958). However, Noone (1943) has described three artefacts from this region which he considers are possibly edge-ground axeheads indigenous to South-Western Australia.

McCarthy (1939) has shown that trade routes into South-Western Australia existed and there can be little doubt that occasional, rare, edge-ground axes would have entered the South-West through these channels (Bates, 1938; Glauert in McCarthy, 1939), but the artefacts described by Noone do not closely correspond with the types of edge-ground axes known from outside the South-West. It is thus unlikely that they are trade articles. In their recent review of the subject, Davidson and McCarthy (1957) have, however, been unable to accept these implements as axeheads at all.

In view of this disagreement and in view of the theoretical implications of the distribution of edge-ground artefacts, a review of the situation is presented with particular reference to these controversial specimens, and others like them, which are now in the Western Australian Museum.

It is concluded that axeheads did occur in South-Western Australia, both by introduction and by local manufacture.

### MATERIAL

The following twelve edge-ground implements, all from localities in South-Western Australia, are in the collection of the Western Australian Museum.

	W.A.M. No.	Description of axehead*	Locality
Group A	A12734	Polished axehead, lenticular section (fig. 3)	Plunkett Mill, nr. Lower Chittering. Collector, W. H. Butler, 1950.
	A12735	Biface coroid, lenticular section (fig. 3)	Plunkett Mill, nr. Lower Chittering. Collector, W. H. Butler, 1950.
	A12736	Biface coroid, lenticular section (fig. 3)	Plunkett Mill, nr. Lower Chittering. Collector, W. H. Butler, 1950.
Group B	10351	Biface coroid, irregular oval section (fig. 4a)	Sth. Belmont. Collector, R. Winter, 1938.
Group C	A12718	Biface coroid, hog-back section (fig. 4b)	Jeramungup, ex Israelite Bay. Collector, J. Roberts, 1912.
Group D	E596	Biface coroid, flattened lenticular section (fig. 5)	Chidlow. Donor, A. Woodhouse, 1900. Described Noone, 1943, fig. 29.
	10492	Biface coroid, irregular rectangular section (fig. 5)	Lake Magenta. Collector, A. Hudson, 1939. Described Noone, 1943, fig. 30.
	10063	Biface coroid, closest to hog-backed section but more nearly triangular (fig. 5)	Dinninup. Donor, Miss Holt, 1934.
Group E	9545	Pebble axehead of rectangular section (fig. 8)	Wooroloo. Collector, J. F. Richardson, 1929.
	A12731	Biface coroid, irregular section (fig. 8)	Walyunga. Collector, W. H. Butler, 1958.
	A12719	Pebble axehead, the section can only be described as approximating to a right-angled triangle (fig. 8)	Mawson. Collector, W. H. Butler, 1957.
Group F	12166	Uniface pebble, lenticular section (fig. 9)	Denmark. Collector, J. Fox, 1953.

## DISCUSSION

### Geographical Terminology

The terms "South-Western Australia," "South-West" and "South-west Western Australia" as applied by various authors can be considered to be roughly synonymous. The area "South-Western Australia" as used in this paper refers to that area south of the mouth of the Murchison River which is described by Tindale (1940) as being populated by uncircumcised people (fig. 1). Since the non-human fauna and flora of this part of Australia is of a highly characteristic nature it might be expected that the human element would conform and it is of interest that Tindale's (1940) limit of circumcised tribes south of the Murchison should correspond so well with the faunistic definition of Woodward (1900), the floristic definition of Gardner (1944) and the physiographic definition of Jutson (1934).

\* The terminology used throughout this paper is that of McCarthy, Bramell and Noone, 1946.

Davidson and McCarthy (1957) distinguish between two areas: "South-west Western Australia" and a further larger area in Western Australia from both of which edge-ground axeheads are missing. This latter area is defined by them as being "west of a line drawn through Mullewa in the west coast [sic] through Cue, Mount Magnet, Southern Cross, to Israelite Bay on the southern coast, at least to the Warburton Ranges in the north and the South Australian border in the east."



Fig. 1.—Map of Western Australia showing the boundary (indicated by broken line) of South-Western Australia as used in this paper. Localities from which axes have been collected are indicated by dots. The inland trade route is shown as a heavy black arrow (see McCarthy, 1939) and localities from which Kimberley pearl shell ornaments have been collected are shown by crosses (McCarthy, 1939, map 14).

### Interpretation of Material

From the localities which accompany the description of the specimens (p. 163) it can be seen that all of these fall within the area described by Davidson and McCarthy (1957) as that in which edge-ground axeheads are lacking. All of the specimens were, as far as is known, exposed on the present-day surface of the ground, so that it is possible that they should all be referred to the most recent period of aboriginal (or even European) occupation. However, the possibility that some may belong to earlier periods cannot be ruled out since some of the surface finds (e.g. Walyunga) were made on the "blown-out" surfaces of eroded sandhills.

If these artifacts are in fact definable as edge-ground implements it is clear that there are only a limited number of possible explanations for their presence. These are that:

(a) Edge-ground artifacts were manufactured in South-Western Australia. This is contrary to present belief.

(b) They are traded articles which have come into the area. Main trade routes in Western Australia pass from areas in which edge-ground axes are common into those in which axes were previ-



ously unknown. These have already been well documented by McCarthy (1939).

(e) They are introductions by non-aborigines.

Since the most important outcome of this discussion must be whether or not edge-ground implements were made in South-Western Australia, it would appear logical first of all to eliminate all specimens which, because of their material structure, history or workmanship, can be assigned to cultures which are known to occur outside South-Western Australia. Material in this category has already been described from other Western Australian localities. For example, McCarthy (1939, p. 174) describes edge-ground axes (Aust. Mus. Nos. E 10577-8) which were traded into districts where they were used "by sorcerers and medicine-men," and Davidson (1935, 1938) obtained three atypical polished stone adzes from widely separated localities. In fact, these specimens are so atypical of known Australian workmanship that neither Davidson (1938) nor McCarthy, Bramell and Noone (1946) have any hesitation in describing them as alien and they suggested that these were probably originally derived from Indonesia, New Guinea or Melanesia. Further Noone (1943, p. 273-5) describes axes from Napier Range (W.A.M. No. 10406) and Grant Ranges (W.A.M. No. 10415) which he considers to be more typically of "Indonesian" than of Australian workmanship.

In order to simplify the discussion, the edge-ground implements with similar histories or characters will be discussed in groups (see p. 163).

#### Group A

The specimens of this group which were collected with two other artifacts, a flake (W.A.M. A12733) (fig. 2a) and a small nucleus (W.A.M. A12732) (fig. 2b) at Plunkett Mill near Perth (Butler, 1958) present a curious problem. One of them (W.A.M. A12734, fig. 3) is a small polished axe of rectangular section, very much like the specimen already described by Noone (1943) from Grant Range as being "Indonesian". The technique is certainly not Australian. It is made from a fine-grained highly-metamorphosed, basic sedimentary rock (greywacke) which, if it is Western Australian in origin, could be South-Western but would be more likely to be from the Kimberley district.

The other two biface coroid axeheads (fig. 3) are what McCarthy, Bramell and Noone (1946, p. 49) would probably describe as the Kimberley variety. In both, the grinding is confined to the cutting edge and to the prominent portions of the completely knapped surface. A12735 is made of a silicified, coarse-grained shale which could have come either from the local south-western metamorphosed Precambrian succession or from the Kimberley district. A12736 is made from a greywacke which could be of local origin but is more likely to be from the Kimberley district. The small block (A12732, fig. 2b) is of ivory coloured quartz which could be local, while the flake (A12733, fig. 2a), which is a primary flake which has been struck from a core, is made of a fine grained local quartzite.

This ill-assorted trio of axeheads was found by Mr. W. H. Butler in a small dry depression in the midst of a dried swamp. The swamp is in a dense thicket near a deserted timber mill, previously known as Plunkett Mill (Ordinance Survey 1 inch map 393, Toodyay, map square 1690). Butler accidentally caught sight of one of the Kimberley type axeheads in the bottom of the depression and found the other two projecting from the earth in the sides of it. The depression was about six inches deep. The specimens were found by Butler in November 1950 and were presented to the Western Australian Museum in 1958. Immediately following their presentation, the site was re-examined by Butler and Miss K. Vollprecht who found the small quartz block, also on the surface within the depression; it had not been noticed on Butler's previous visit in 1950. Finally, Butler, V. N. Serventy, C. Halls and I excavated the depression.

Upon excavation it became clear that the depression had been originally produced following the complete destruction of a large tree stump by fire. The resulting cavity had become secondarily filled with debris, most of which was silt and fine sand which had probably been carried into it during periods when the swamp was full of water. This secondary filling was removed by us and was found to contain the primary flake. No other artifact was found. The flake was in undisturbed filling four inches below the surface of the filling in the depression. Some laterite nodules in the depression had been burnt, but none of the artifacts showed any signs of having been through fire.

The swamp and surrounding area were also examined and there can be no doubt that there have been at least two levels of occupation in it. First of all, aboriginal millstones were not uncommon (W.A.M. Nos. A12738, 39, 40, 41) denoting fairly extensive aboriginal habitation; secondly, there was European debris from the small timber mill which was within one hundred yards of the depression.

The nature of the axeheads would argue that they were not manufactured in South-Western Australia, but the decision as to

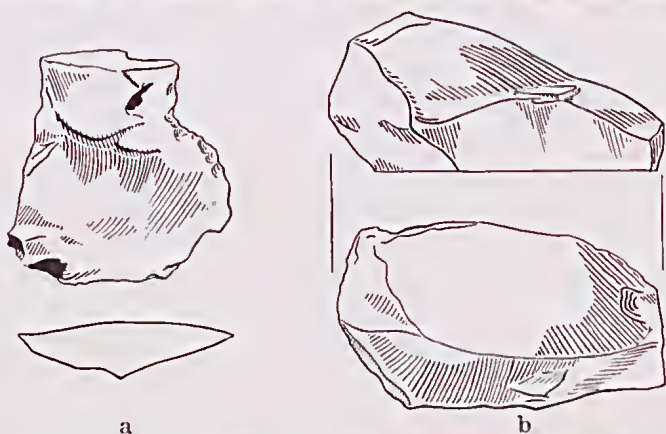


Fig. 2.—Artifacts from Plunkett Mill. (a) A flake, W.A.M. A12733. (b) A nucleus, W.A.M. A12732 (approximately natural size).

whether they were aboriginal articles which had come to the area by trade (for evidence of trade with the Kimberley, see fig. 1), or whether they represent a European dumping, depends upon a number of factors, the most important of which being whether or not this heterogeneous association is natural. If it is, the presence of the

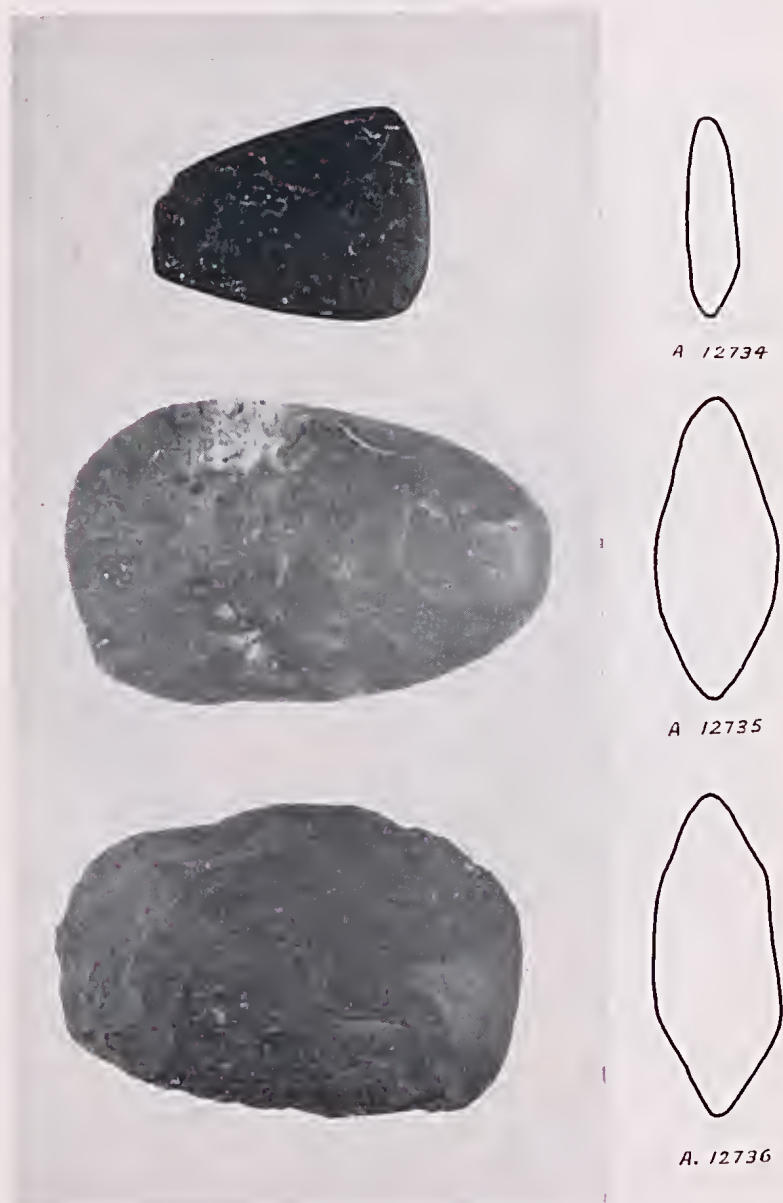


Fig. 3.—The axes of Group A. The line drawings are sections taken at approximately the mid-points along their lengths (approximately  $\times 3/5$ ).



flake, which is neither attractive nor, to an untrained European eye, obviously an artefact, would suggest that the specimens represent an aboriginal hoard. However, this cannot be determined, so that we are forced to conclude that it is equally possible that the surface finds are European curios of the timber mill period, while the flake alone belongs to the earlier aboriginal occupation level.

#### Group B

The only specimen in this group is a single biface coroid (W.A.M. 10351) of irregular oval section (fig. 4a). It was found on a road in South Belmont by Mr. Robert Winter in 1938. The material is a basic igneous rock which is not found locally. If it is Western Australian it could have originated in the Pilbara or North Kimberley areas of the State.

Mr. N. B. Tindale, Curator of Anthropology at the South Australian Museum, has examined this specimen with me and he is of the opinion that the type is Victorian. Axes of similar type enter South Australia by trade routes from the south of the State. Tindale



Fig. 4.—(a) The axe of Group B. (b) The axe of Group C (both approximately  $\times 3/5$ ).

has recently obtained specimens from as far west in South Australia as the vicinity of Woomera. Dr. D. L. Serventy possesses a similar specimen from Malcolm, near Laverton, W.A. However, in spite of the fact that stone artifacts of this type might possibly enter South-Western Australia by aboriginal trade routes, the fact that this specimen was found on the surface of a made European road would argue that it is an introduction by a non-aboriginal which has become mislaid.

#### **Group C**

This group also contains a single axehead (W.A.M. No. A12718) which is very small (6.7 cm. in length) and the cutting edge is at the narrow end (fig. 4b). All surfaces are knapped and grinding is extensive, not being confined to the cutting edge. The specimen was obtained by Mr. J. Roberts at Jeramungup from an aboriginal who stated that he had brought it from Israelite Bay.

Because of its provenance, this axehead is of the greatest interest. It can be traced from a point well within the South-West back to a locality which is on the south-eastern edge of the area in Western Australia which was inhabited by the unenculturated peoples. Nevertheless, this place (Israelite Bay) is itself still well within the area in which, according to Davidson and McCarthy, edge-ground axes are lacking. The axe is made of a greywacke and there is no rock of this nature at Israelite Bay. Mr. M. Ellis is of the opinion that the nearest occurrence of this material to this locality is at Fraser Range, some 80-90 miles to the north; he says that it also occurs much further north in the Warburton Ranges. It is probably significant that four specimens from the Warburton Ranges in the Western Australian Museum collection (Nos. 11561-4) are almost identical with it in technique of manufacture. These, however, are of diorite and could actually have been manufactured in the Warburton Ranges where exposures of diorite occur. The Warburton Ranges are situated on the northern limit of the axehead-free area given by Davidson and McCarthy (1957), and McCarthy (1939) has clearly shown that a major inland, north-south trade route existed along which the Jeramungup-Israelite Bay specimen could have come (see fig. 1).

#### **Group D**

This group of artifacts (fig. 5) comprises the most important and most controversial of all the known South-Western Australian edge-ground implements. They were described by Noone (1943) as edge-ground axeheads. Davidson and McCarthy (1957) found it difficult to accept them as axes, since (p. 431) "They do not constitute a type in themselves. None conforms to any known types of axe in any other part of Australia. None shows any evidence of having been hafted."

It is difficult to support this denial that these artifacts are edge-ground axeheads on these typological grounds since, in the standard Australian terminology (McCarthy, Brame and Noone, 1946) which these authors accept, the biface coroid axehead is described as follows (p. 49):



"The majority of biface coroid axeheads are oval or irregular in tranverse section. They are, however, generally rounded on the lateral margins and may be convex or flat on the upper and lower surfaces. It is probable that some are made from knapped blades, but the great majority are fashioned from quarried lumps or from nodules or pebbles. The shape varies considerably, and it may be

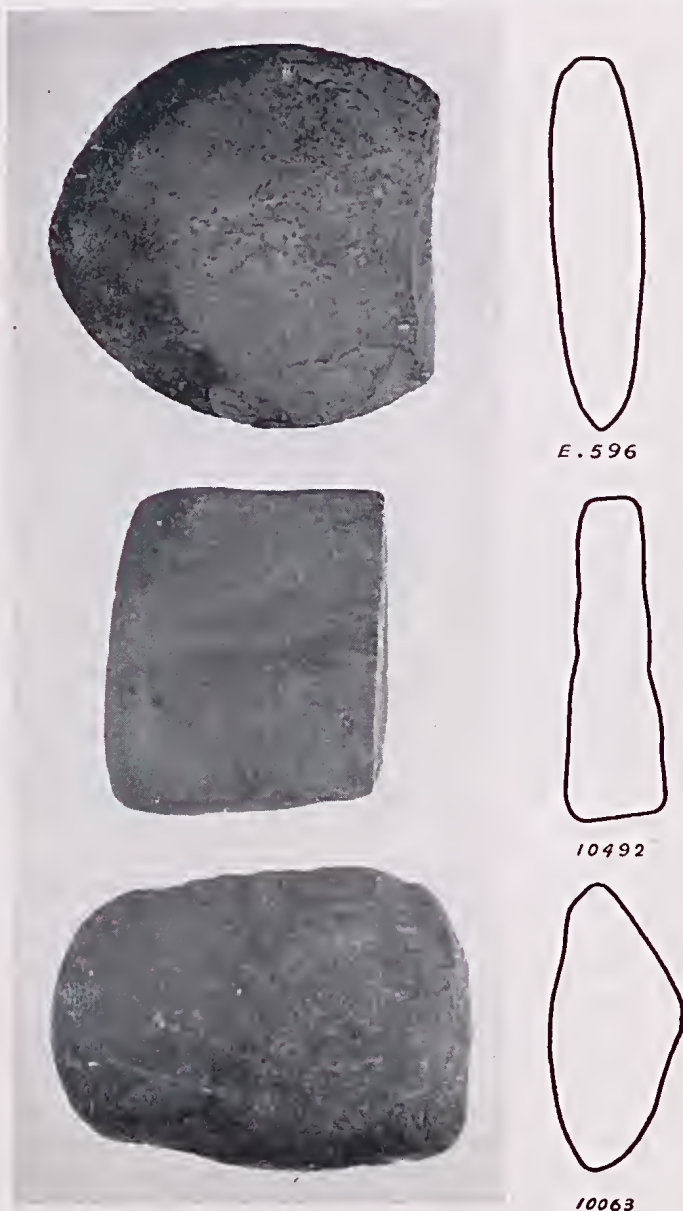


Fig. 5.—The axes of Group D (approximately  $\times 3/5$ ).

oval, ovate, elongate, rounded, triangular, reetangular, quadrangular, wedge or gad-like. Shape is not a satisfactory criterion of classification for these axeheads as a whole, but it is of some value in distinguishing local types. The width of the ground facets varies considerably, and the grinding frequently extends well up the body of an axehead." This description does not actually exclude any of these artifacts described as axeheads by Noone.

Further, the absence of evidence of hafting is scarcely relevant since McCarthy, Bramell and Noone (p. 46) clearly state that in some areas "axeheads" were not hafted and were used principally in the hand.

The statement that the implements do not constitute a type in themselves is not strictly true. Two further implements in the collection of the Western Australian Museum, when considered together with the three controversial artifacts would make it appear that, to the contrary, these implements do in fact constitute a very definite type. These two further specimens are knapped biface coroid implements. One of them (W.A.M. No. 10067, fig. 6), previously described by Noone (1943, p. 279) as a flaked hatchet-blade, is of greywacke and was found at Rushy Pool at Narrogin. The other (W.A.M. No. 12206, fig. 6), a much larger and skilfully made piece fashioned from an indurated shale, was found on the surface at the Walyunga site in the Swan Gorge by Butler. This latter is lightly ground



Fig. 6.—Kodja stones from Narrogin and Walyunga (approximately  $\times 3/5$ ).

near the cutting edge but not sufficiently so to warrant its classification as an axehead.

The three specimens previously described by Noone are made of indurated sandstone (W.A.M. No. 10492), indurated shale (W.A.M. No. E596), and probably diorite (W.A.M. No. 10063). Thus the material from which all five specimens are made could have been found in the South-West by their fabricators.

These five artifacts have one major feature in common and it is a feature possessed by no other Australian edge-ground axe seen by me; each axehead has a deliberately fractured plane surface which lies at right angles to its long axis and which forms a flattened butt to the artifact. This feature would argue that the implement was designed to be hafted by inserting both it and a stick into a knob of resin after the manner of a typical South-Western *kodja*, of which the least finished of the five (10067) appears to be a typical blade. It seems possible that here, in this series, we can illustrate the progressive elaboration of the knapped biface *kodja* blade into a ground and polished blade which was designed to be similarly hafted. While it is true that edge-ground and hafted *kodja* blades do not appear to have been recorded, and that none of the sixteen *kodjas* in the collection of the Western Australian Museum shows any sign of edge-grinding, there is some evidence that this did occur in some localities. J. F. Haddleton, a pioneer inhabitant of the Katanning area since 1879, states (1952, p. 103): "And to explain the blacks' axe and how it was made. The axe head was made by putting a big fire in a very hard granite rock making the rock hot. They would then take off the fire and throw cold water on the rock and this would cause the rock to crack and come off in big shales, they then break them into small pieces about four inches long and three inches wide. This piece would be the shape of an axe head, about one inch thick, tapering off to a sharper edge. *They then rub the sharp edge on another kind of sandstone and make the edge smooth and sharp* [my italics], then they would get a piece of wood about the size of a hammer handle, make it smooth by scraping it with a piece of glass, flatten out one end to make it fit on the top of the stone axe and a piece of blackboy gum about the size of a hen egg, melted and run over the piece of wood and the top of the piece of stone. When the gum gets cold it sets very hard and that was Koyeh [= *kodja*], and this was used to cut notches in the bark of the white gum trees to enable them to climb up after opossums."

The size of the larger artifacts (i.e. those from Chidlow and Walyunga) might suggest an obstacle to their acceptance as haftable *kodja* blades. The greatest diameters of the five artifacts is 6.0, 7.2, 8.4, 8.7 and 8.9 cm. while those of the twenty-nine hafted blades in the sixteen *kodjas* examined by me range from 3.5 cm. (W.A.M. No. 8100) to 7 cm. (W.A.M. No. E637). Physical tests upon the adhesive properties of blackboy (*Xanthorrhoea*) gum have not been made by me to examine the validity of this objection, but in the South Australian Museum there is a *kodja* (S.A.M. No. 30076) which was made, and has been often used, by Tindale. This contains a stone 7.7 cm. in diameter and the gum



holds it well. The two stones in this demonstration instrument are archaeological specimens and there is little doubt that, in spite of the size of the larger one, they were made to be used in a gum hafting. It would thus appear that the size of the artifacts as compared with modern specimens in collections does not necessarily mean that they are not haftable in this manner.

Davidson and McCarthy (1957) suggested, without having examined the material, that the specimens described by Noone are probably rather atypical upper grinding stones. This statement, in view of Noone's great experience of stone artifacts, is rather surprising, and they supported their argument by stating that polish-

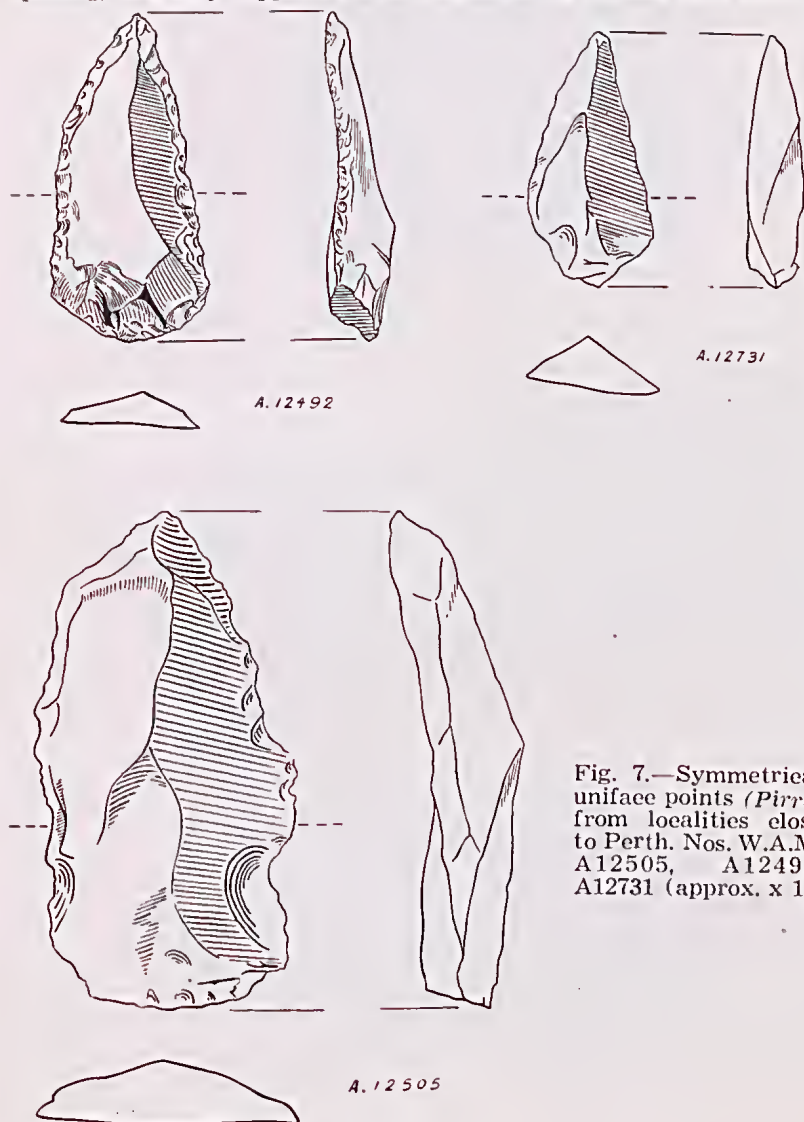


Fig. 7.—Symmetrical uniface points (*Pirri*) from localities close to Perth. Nos. W.A.M. A12505, A12492, A12731 (approx. x 1).

ing of artifacts is not known in this area. The stone implements of South-Western Australia are poorly known and in our present state of knowledge it is exceedingly risky to base arguments on the absence of an implement type from the record. The ease of the *pirri* point may be taken as an example. For many years this artifact was believed to be absent from the southern part of the state of Western Australia, until in 1943 Noone reported that Tindale had



Fig. 8.—The axes of Group E (approximately  $\times 3/5$ ).

obtained a specimen at Newman Rocks to the north-east of Esperance. Later Tindale (1957) reported that Dr. H. Petri had found *pirri* implements near Perth, and in recent years many *pirri* from several localities in the Swan River District have been collected by various collectors. These (fig. 7) are now in the Western Australian Museum.

The age of the axes in this group is a matter of some importance, since if they are in fact archaeological they may form part of an earlier "*Pirri*-containing" culture phase which Tindale (1957) believes has been superseded by the present day "Mudukian-like" culture. Support to this suggestion is given by the fact that *pirri* are found on the surface at the Walyunga site where the knapped biface coroid W.A.M. No. A12731 was found (see Group E below). Edge-ground implements do not form part of known Pirrian industries.

On the other hand, if the surface nature of the finds does denote that they belong to the most recent level of aboriginal culture in South-Western Australia, it appears likely that the spread of edge-grinding and polishing techniques to blades which were possibly to be hafted in the *kodja* manner would imply that we have another example of a technique spreading in advance of sufficient knowledge to produce the finished artifact to which the technique was originally applied. In the case well documented by Davidson (1935), it was shown that, subsequent to the spread of occasional Kimberley biface points into the territory of the Wardaman people of the Northern Territory, crude pressure-flaking techniques spread among them which, however, were not sufficiently developed to produce Kimberley biface points. Davidson considered that the experimental technique spread because of the excitement engendered by the novelty of the new artifacts. There can be little doubt that occasional traded axeheads reached the South-West and these may have provided the models and the stimulus for the spread of experimental grinding techniques through the area. It is indeed fortunate for Australian archaeology that Davidson actually observed the spread of the pressure-flaking technique into the Northern Territory, since without his warning of the experimental nature of the artifacts which it produced, they would have been exceedingly difficult to interpret as a part of the present-day Wardaman culture pattern.\*

### Group E

The three specimens in this group are all made of local stone and differ from those of Group D in that none is abruptly truncated.

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\* Note added in press: Since this was written, two further axeheads which should be classed with this group have come to light. Both are closely similar in degree of grinding, technique, and shape of ground surface to the axehead from Dininup. One of these, E357, has been in the Museum from the earliest period of the collection and is without data. It has the typical flat fractured end of the other axeheads in this group. The other (A12772), which was presented by Mr. D. H. Perry in response to the appeal by Butler (1958, p. 136), was collected north of the Blackwood River between Jalbaragup and Augusta in 1919. This specimen is smaller than the others of Group D and is less abruptly truncated but there is no doubt that it belongs with them.



It is therefore unlikely that they were hafted in *kodja* manner and must either have been held in the hand or hafted with a bent withy. The fact that they are aberrant in shape even when compared with the specimens in Group D would either indicate that experiments in edge-grinding had not yet had time to settle down to a definite pattern, or that this early "*pirri*-containing" industry is characterised by the great diversity of types of its edge-ground axeheads.

The first specimen (W.A.M. No. A12731, fig. 8) is a roughly knapped biface coroid which was found on the surface at Walyunga by Butler. It is made of indurated shale and the grinding has been more or less confined to the cutting edge. It is irregular in section. The second specimen is from Wooroloo (W.A.M. No. 9545) and was found in 1929 by J. F. Richardson; it can only be described as an adzehead since the ground cutting edge lies to one side of the mid-longitudinal plane. It is made of a fine-grained diorite, has a very regular rectangular section, and appears to have been pecked rather than knapped. The remaining specimen is a pebble axehead (W.A.M. No. A12719, fig. 8) which was found on the surface at Mawson by Butler. Apart from the ground-edge it is untrimmed and there is a faint groove around it which may indicate that it was once hafted with a bent withy.



Fig 9.—The axe of Group F, and the trimmed pebble from Walyunga (approximately x 3/5).

Professor R. T. Prider of the University of Western Australia has examined this specimen and says (pers. comm.) that the rock is a fine-grained hypersthene dolerite in which the hypersthene has been altered. Similar rocks occur in the South-West of the State and it is possible that the specimen came from the vicinity of Mawson itself. Thus it may be concluded that the material from which all specimens in this group are made is obtainable locally.

#### Group F

This group contains a single lightly edge-ground uniface pebble artifact (W.A.M. 12166, fig. 9) which, although resembling those of Group E in that it was probably hand held or hafted with a withy, is much more roughly knapped and is scarcely ground. The butt is not knapped. It was collected at Denmark in 1953 by J. Fox. The specimen is made from a pebble of impure quartzite which is obtainable in the South-West.

A further uniface pebble artifact in the collection of the Western Australian Museum (W.A.M. No. 12727, fig. 9) may be an uncompleted axhead of this type. It is also of quartzite and was found by me on the surface at Walyunga. One face is very roughly trimmed along the cutting edge but there is no sign of grinding.

### CONCLUSIONS AND SUMMARY

From the variety and number of the artifacts described and discussed above, a number of which do not appear to be of types known outside South-Western Australia, it would appear probable that, at some stage in the history of aboriginal occupation, edge-grinding techniques were practised in the south-west corner of Australia. This is contrary to existing ethnological statements.

The seven edge-ground axheads which appear to be of undoubted local manufacture (Groups D, E and F above) would appear either to be experimental objects produced in the initial stages of the spread of edge-grinding techniques from the north (and perhaps from the Western desert tribes in the north-east), or else represent weathered-out surface finds from an earlier *pirri*-containing industry for the existence of which there is considerable evidence. Further archaeological work must be done before these possibilities can be tested.

Since some edge-ground axes were undoubtedly brought into the area by trade and by Europeans, it is necessary to doubt the autochthonous nature of any implement which is made by a known foreign technique or is made of non-local stone, despite the possibility that such stone could have been introduced as raw material by trade.

### EPILOGUE

In view of the apparent contradictory nature of the main conclusions of this paper as compared with current beliefs, it is as well to remember two remarks of the late Professor D. S. Davidson, a pioneer of Australian archaeology and in particular of the study of Western Australian stone artifacts—

"The whole problem of Australian archaeology is still so much in its infancy that conclusions which may now appear to be obvious must be considered only as tentative" (1935, p. 149).

"We cannot be certain at the present time of the derivation of most of the stone tools and weapons found in Australia. Many of them have been reported as surface finds only in localised areas and, as a result, appear to be indigenous to those regions. The danger of drawing conclusions before archaeological studies have been made is well illustrated in the case of the grooved axe" (1935, p. 148).

#### ACKNOWLEDGMENTS

For the identification of the stone from which the artefacts are made and the information about its distribution, the author is indebted to Mr. M. Ellis, the Government Geologist of Western Australia, and also to Professor R. T. Prider who sectioned and examined axe No. A12719.

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## ARE MARSUPIALS "SECOND-CLASS" MAMMALS?

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Under the heading of the "evolutionary position of the marsupials" Colbert (1955) writes: "it appears that the marsupials have been and are 'second class' mammals as compared with the placentals," and later: "it is probably valid to think of the marsupials and placentals as arising at about the same time, during the Cretaceous period. They developed two quite dissimilar methods of reproduction, as well as various anatomical differences. During the early stages of their evolutionary histories they were probably well matched, so that marsupial adaptations were about as efficient as placental adaptations. But as time went on, and especially at the opening of the Cenozoic era, the placentals became dominant. There were probably various factors that led to the dominance of the placentals over the marsupials, but of these it is likely that the superior intelligence of the placental mammals was of particular importance."

Beliefs essentially similar to these are frequently expressed or implied by zoologists and palaeontologists. That the marsupials are considered to have an inferior organisation has not arisen directly from a comparative study of their organisation; it has been inferred from the supposition that marsupials become extinct when exposed to competition from placentals. Such suggestions as the marsupials having inferior intelligence and methods of reproduction are usually offered as explanations for their succumbing to competition and predation by placentals, rather than as opinions based on disinterested comparisons of those systems.

I do not quarrel with this approach. Indeed, it seems to be the only one. For we cannot isolate an organ or adaptation and assess its survival value *in vacuo*; we must first observe how well it serves the animal in nature. If a certain species withstands competition from another, it is axiomatic to say that its organisation and therefore all its organs and adaptations individually are adequate. We might also be able to say that its organisation is as good as that of the second species. Conversely, if it does not survive, we will conclude that the first animal was generally not so well adapted as the second; though in what particular way or ways it was inferior will not be so readily ascertained.

So much for methodology, but what of our materials? We can observe in Australia the effect of placental carnivores and herbivores on their marsupial counterparts. But what will we learn from this of the relative merits of placental and marsupial organisation? Before comparing say, the inherent sprinting ability of two